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guauqui." "Parca," double; thus a hill which seems made up of two hills united, is called "Parca-urcu."

"Angas," a hawk. "Ambátu," a kind of toad.

"Sácha," forest. "Cáspi," tree. "Yúras," herb. "Quínua," the "Chenopodium Quinoa," cultivated for its edible seed. "Pujín," hawthorn (various species of *Cratægus*); thus "Moñtana de Pujines," Hawthorn Forest; "Cerro Pujin el chico," Little Hawthorn-hill. "Cubillín," a sort of Lupine, found only on the highest paramos. It gives its name to a long ridge of the eastern Cordillera, mostly covered with snow, extending from Condorasto and El Altar towards Sangay. "Totorra," a large bulrush from which mats are made; hence "Totorrál," a marsh full of bulrushes. "Sara," maize.

"Tópo" is the name given in Maynas to the Raft-wood trees, species of *Ochroma* (of the N. O. *Bombaceæ*). They begin to be found as soon as we reach a hot climate, say from 3000 feet elevation downwards.

"Rundu," sleet; thus "Rundu-uma," Sleety Head. "Rásu" is snow, and occurs in "Chimbu-rasu, Caraguai-rasu" (Carguairago), and many other names. The vulgar name for snow as it falls is "Papa-cara," *i. e.* potato peelings.

"Pucará" indicates the site of a hill-fort of the Incas, of which a great many are scattered through the Quitonian Andes.

XII.—*Journey from Quito to Cayambe.* By DR. WILLIAM JAMESON. 1859.

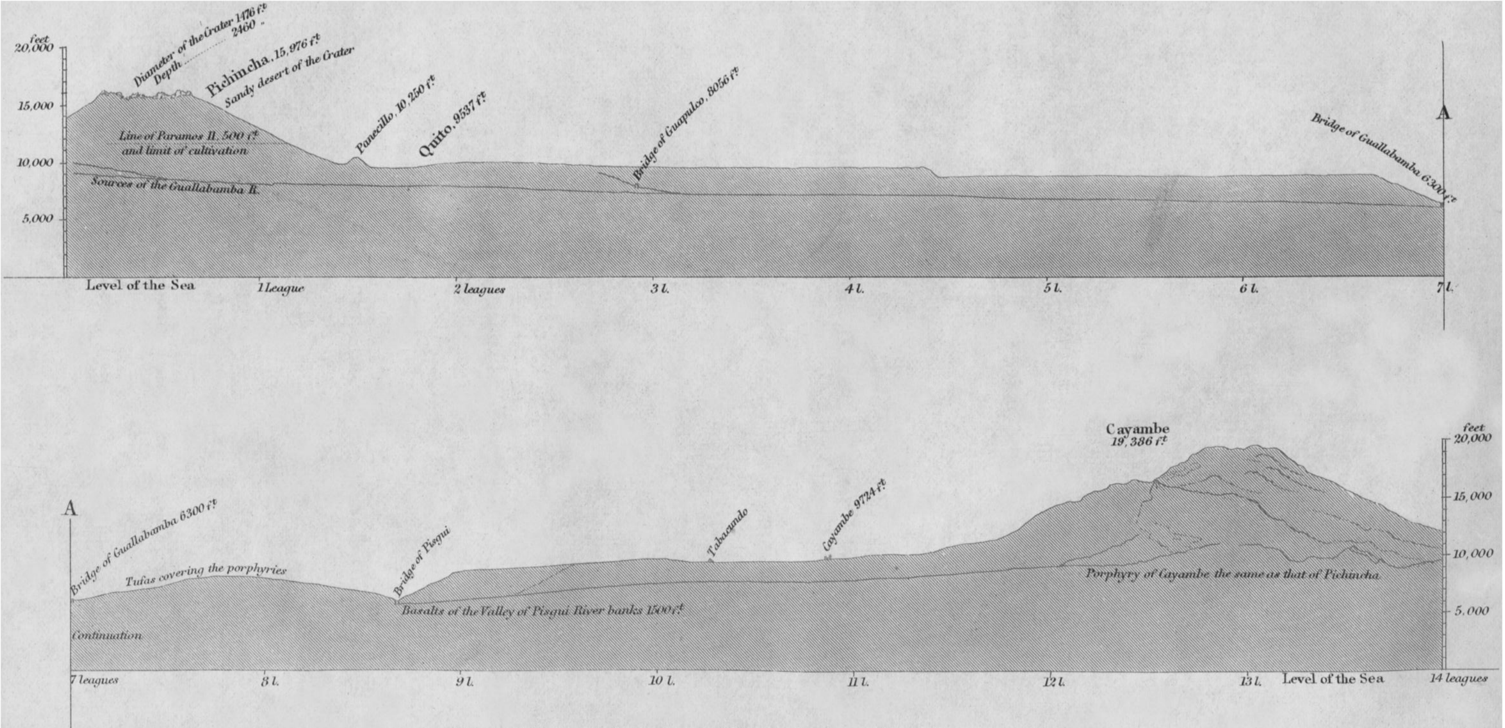
Read, March 12, 1860.

A WEEK'S relaxation from my duties at the University of Quito gave me an opportunity of making an excursion to Cayambe, a snowy mountain of imposing aspect, situated E.N.E. of Quito, and, according to Humboldt, directly under the Equator.

Before setting out I shall offer a few observations on the city of Quito, where I have resided for so many years.

Quito is built on what may be called a ledge of the volcanic mountain of Pechincha, at an elevation of 9528 feet above the level of the sea. The mountain rises in the background to a height of 15,976 feet, and is crowned by a wall of trachytic rocks surrounding the crater, the depth of which is 2460 feet; and consequently the bottom, where a volcanic agency is in active operation, is nearly 4000 feet above the level of the city. Snow frequently falls on the sandy desert of the crater; but two or three days of fine weather cause its disappearance, excepting in some

Section of the Valley of Guallabamba, between Pichincha and Cayambe



Published for the Journal of the Royal Geographical Society, by J. Murray, Albemarle Street, London, 1862.

localities where it lies in patches, sheltered from the rays of a vertical sun. The summit of Pechincha barely enters the snow-limit, for which reason the congealed water does not assume the compact and crystalline form observed in what is strictly called a glacier. The snow brought down to the city for the preparation of ice-cream has the appearance of a conglomerate of hailstones. On the eastern chain there are several very lofty summits, capped with immense masses of solid ice, reflecting the rays of the setting sun, and presenting to the eye various beautiful prismatic tints, which, so soon as the solar light is withdrawn, assume a pure white colour.

The climate is agreeable and salubrious, the mean temperature being about 57°. The thermometer never rises above 64°, nor sinks below 46°. The average range within the twenty-four hours may be stated at about 10°. These observations of course apply to Quito and the neighbouring plains. A journey of four hours will place the traveller in the region of eternal frost, or, in the space of half a day he can descend the deep and sultry valleys that separate the mighty chains of the Andes; or, finally, he may visit the tropical forest extending to the shores of the Pacific. This variation of temperature, dependent on elevation, and occurring within narrow limits, furnishes a daily and diversified supply of vegetable food: from the plantain, which, as a substitute for bread, is largely consumed by the inhabitants of the coast, to the wheat, potato, and other grains and roots, growing luxuriantly on the cool table-lands of the interior. Besides these, the market is furnished with pine-apples, chirimoyas (*Anona chirimoya*), guayavas (*Psidium pomiferum*), guavas (*Inga pachycarpa*), the fruits of different species of passion-flower, oranges, and lemons; and, from January to April, certain European fruits, such as apples, pears, quinces, peaches, apricots, and strawberries, the last-mentioned fruit having been probably introduced from Chile.

The population of Quito does not exceed 40,000. On several occasions the Government has been desirous of ascertaining the actual number of inhabitants, but without arriving at a satisfactory result. The people became alarmed, from an idea that the formation of a census is a preliminary step towards the imposition of a tax, and the information thus obtained was necessarily defective.

The summit of Pechincha can at no time be seen from the town or its immediate vicinity. Viewed a little from the eastward, the flank of the mountain presents four successive zones. The lower portion, extending from the base to an elevation of 10,500 feet, has a climate still available for the production of wheat, barley, and "quinoa" (*Chenopodum*), potatoes, and other roots, of South American origin (*Oxales*, *Basella*, and *Tropæolum*), and a few other hardy vegetables. Next in succession is a belt of shrubs, forming the line of division between the lower region just described and that to be presently mentioned. In some districts the shrubs constitute a varied and interesting flora. Beyond them commences the "paramo," or pasture-ground of the Andes, between the limits of 12,000 and 14,500 feet of elevation; a region of great horizontal extent, thickly clothed with hard wiry-leaved grasses, of a hue intermediate between green and yellow, and capable of sustaining countless herds of cattle. At 15,000 feet vegetation becomes less vigorous. The grass, instead of covering the entire surface, is distributed in patches or tufts, intermingled with a few hardy shrubs of valerian, *Chuquiraga*, and *Baccharis,* all of which grow and flourish on the sandy desert of the crater. A singular lupine, bearing a floral spike like a fox's tail (*Lupinus alopecuroides*), is characteristic of this region; also an umbelliferous plant (*Petroselinum dissectum*, Benth.), which, by proper management, might yield good celery. In other situations the volcanic débris, rolled down from the summit, displays patches of more humble growth, adorned, however, with large and bright blossoms, yellow, blue, purple, and violet. Of the latter description are those of *Sida Pichinchensis*, which, from their natural association with snow and sleet, recall to memory some of those charming plants we so much admire in our gardens as the harbingers of spring.

The people are generally kind and courteous to strangers, and rarely infringe the rights of hospitality. They are, moreover, endowed with a good natural capacity, but lack the energy and perseverance to accomplish an important undertaking. I regret to say that, for the last thirty years, there has been no social or financial improvement in the condition of the country. In proof of this assertion, I aver that no road to the coast has yet been opened, and that the only one (described by Ulloa in a work published at an early period of the last century) has undergone no manner of repair. Its southern termination is nearly concealed by a rank tropical vegetation, or obstructed by fallen trees undergoing different stages of decay. There is for one-half of the year an almost total suspension of commerce between Guayaquil and the interior. Should any article in the shape of a box or bale arrive at the port during the rainy season, the owner, who may be in Quito, must wait for it perhaps six or eight months, or till the road becomes *naturally* passable.

Education has never been patronized by the Government or members of Congress, who yearly assemble in the capital; for which reason the system at present pursued must be considered objectionable, inasmuch as attention is principally devoted to the study of law, medicine, and theology, to the neglect of practical science.

The salaries of the professors amount to 3950 dollars, and the rents of the University amount annually to the sum of from 4000 to 4500 dollars. No fees are paid by the students to the professors.

I shall now proceed on my journey. For about 15 miles beyond the suburbs, in a north-easterly direction, the country is nearly level, and clothed with an ever-verdant growth of native grass, dotted with trees of wild cherry and myrtle. The former (*Prunus salicifolia*) seems to thrive best on a light dry soil. Around the villages of Tacunga, Ambato, and Riobamba, built on a sandy plain, and situated respectively at 50, 70, and 100 miles to the south of Quito, the plantation of the wild cherry or "Capuli" is considered a matter of importance, because its wide-spreading roots, extending beneath the barren surface, bind down or restrain the encroachment of sand under which the crops might be buried.

Pursuing the same direction we arrive at the brow of a steep hill, forming the western flank of the valley of the Guallabamba, and descending a lengthened path, in many places winding and precipitous, we reach the bottom of the valley, and cross the river by a bridge constructed of stone. The river Guallabamba has its origin at the head of the valley of Chillo, and becomes augmented by several streams, flowing principally from the eastern Cordillera. It finally unites its waters with those of the Esmeraldas in its course to the Pacific.

The descent from the table-land to the bottom of the valley, measuring perpendicularly nearly 3000 feet, can hardly be achieved in less than two hours, during which the traveller is incommoded by the sun's heat reflected from the bare rock, to avoid which he prefers, if possible, starting with the early dawn. The bridge of Guallabamba is 6300 feet above the level of the sea.

The flora has now assumed a distinct character. Instead of *Ranunculi* and *Calceolariœ*, whose yellow blossoms enliven the fertile meadows to the south of Quito, we behold a parched rocky soil, producing Euphorbiaceæ (*Euphorbia*, *Croton*), Bromeliaceæ *Agave Pourretia*, *Pitcairnia*, *Tillandsia*), various species of Cactus, and lastly, a *Mimosa*, with *Tillandsia usneoides*, hanging in profusion from its branches.

The village of Guallabamba is situated about a mile farther to the eastward, 646 feet above the bed of the river. The houses are low, having merely a ground-floor with wattled walls: that is to say, they are constructed of a species of wild cane interwoven with twigs. The only stone edifice was the church, now a shapeless heap of ruins since its overthrow by the earthquake of last year.

Guallabamba, from its temperate climate, produces various semitropical fruits, as the chirimoya and lemon; but the staple article is the sugar-cane, which here requires a period of eighteen months to arrive at a state of maturity. The proximity of a plot of marshy ground renders the locality unhealthy, and severe agues are prevalent. A single night's sojourn in the village will frequently communicate the germ of this malady, which may, after several days, be developed in another situation far removed from its influence.

On the 22nd of December I left Guallabamba, an hour before sunrise. The road to the eastward of the village is traced over hills of sand, or rather an agglutinated volcanic earth or scoria, on which grow little trees of *Mimosa,* with globular golden flowers. An arborescent *Acacia* is also common, the pods of which, from their powerful astringency, are applied to the same uses as the gall-nuts of Europe.

At daybreak we crossed the Pisgui by a stone bridge. This stream has its origin in Cayambe, and at this point flows over huge masses of basalt, a rock forming the banks of the river, and elevated nearly 1500 feet above its channel. A narrow path ascends from the opposite side, apparently cut with much labour through the basaltic rock, and paved with the same material.

After a tiresome ascent, which occupied us for nearly two hours, we at length reached the table-land, extending to the base of the eastern Andes. The air was cool and refreshing, and the sky clear and cloudless. Directly in front of us rose majestically the mighty dome of Cayambe,* with its dazzling surface of snow, through which bristled some naked rocks, whose position might be 2000 or 3000 feet above the usual snow-limit.

At noon we passed through the village of Tabacundo, a prolonged line of houses occupying both sides of the high road. It has about 2000 inhabitants, and the houses are constructed of sunbaked bricks, or "odoves," with tiled roofs.

The village of Cayambe is situated three or four miles further to the eastward, on a gentle declivity, forming the base of the mountain bearing the same name. Its elevation is 9724 feet, or nearly 200 feet higher than Quito. Its flora is in every respect similar. The soil is remarkably fertile, and well watered by numerous streams flowing from the snowy region in the background. This abundance of water enables the land-proprietor to establish a system of irrigation, imparting a remarkable freshness and beauty to the surrounding landscape.

I am acquainted with no other mountain district where cattle are so numerous. The number of these animals distributed over the different farms cannot be less than 30,000, and their respective owners derive a liberal emolument from the produce of the dairy, particularly cheese, an article consumed in this country to an enormous amount.

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* Mount Cayambe, in lat. 0° 0', elevated 19,386 feet above the level of the sea. Photograph taken 26th December, 1859.

The following are the prices of some of the agricultural productions of Cayambe :—Cattle are worth from 20 to 25 dollars a head; a sheep from 2 to 5 reals; a quantity of wheat, weighing 16 arrobas (16 pounds), is worth 12 dollars; barley, 4 reals the arroba; potatoes, 6 reals the sack. Beef is sold at 6 reals the arroba. A fowl costs from 1 to 1½ real.

December 23rd.—Close on Christmas, and therefore to persuade any one to accompany me to the snowy region was utterly impossible. I had to wait three days, and on the 26th set out, attended by an Indian guide. Our ascent by the northern side, though an easy one, occupied us about six hours. Towards the afternoon we had reached an elevation of 14,000 feet, when my guide pointed out to me a forest, which, on close examination, I found to consist of trees of two species of *Polylepis*. In the midst of it we found a hut well covered with straw, and abundance of material for fuel. Early on the day following I ascended to the snow-limit, and, botany being my principal object, registered all the plants I observed. I cannot say there is any material difference between the flora of Cayambe and that of Pechincha. The accompanying list contains the species I met with on this occasion, and also a rough sketch representing a section of the valley of Guallabamba between Pechincha and Cayambe.

Quito, 25 *Jan.*, 1860.

Plants collected on Cayambe, Dec. 27, 1859.

Ranunculaceæ.—Ranunculus Gusmanni, H. B. K., snow limit; R. Peruvianus, D. C., "Paramos," at 13,000 feet; R. Bonplandianus, Kth., 10,000 to 13,000 feet.

Cruciferæ.—Turritis hispidula, D. C., at 13,000 feet; Draba alyssoides, D. C., snow limit; D. obovata, Benth., snow limit.

Polygalaceæ.—Monina crassifolia (Hebeandra crassifolia, Bonpl.), at 13,000 feet.

Caryophyllaceæ.—Cerastium imbricatum, H. B. K., snow limit; C. floccosum, Benth., snow limit.

Hypericaceæ.—Hypericum laricifolium, Pers. Syn., 11,500 to 13,000.

Geraniaceæ.—Geranium acaule, H. B. K., at 13,000 feet; G. sibbaldioides, Benth., snow limit.

Leguminosæ.—Lathyrus gladiatus, Hooker, 12,000 to 13,000 feet; Lupinus humifusus, Benth., 13,000 feet; L. nubigenus, H. N. K., 13,000 feet; L. alopecuroides, Desr., snow limit.

Rosaceæ.—Rubus glabratus, H. B. K., var., fol. solitariis, basi subcordatis, 13,000 feet.

Sanguisorbaceæ.—Alchemilla nivalis, H. B. K., snow limit; Polylepis incana, H. B. K., 13,000 to 14,000 feet; fol. impari-pinnatis, racemo florifero prolongato, 13,000 feet; Margyricarpus tetosus, R. N. P., 10,000 feet.

Onagraceæ.—Epilobium Bonplandianum, H. B. K., 13,000 feet.

Grossulariaceæ.—Ribes frigidum, H. B. K., 14,000 feet.

Saxifragaceæ.—Saxifraga Andicola, H. B. K., 14,000 feet.

Umbelliferæ. —Azorella aretoides, Willd., 13,000 feet; A. pedunculata, Willd., 14,000 feet; Petroselinum dissectum, Benth., 14,000 feet; Eryngium humile, var. subacaule, Cav. Ic., 11,000 to 12,000 feet.

Valerianaceæ.—Valeriana Bonplandiana, Wedd., at the snow limit; V. microphylla, H. B. K., 12,000 to 13,000 feet; V. plantaginea, H. B. K., snow limit.

Compositæ.—Chuquiraga insignis, H. B. K., 14,000 feet; Culcitium reflexum, H. B. K., 14,000 feet; C. nivale, H. B. K., snow limit; C. rufescens, H. B. K., snow limit; Andromachia acaulis, H. B. K., 14,000 feet; Werneria graminifolia, H. B. K., snow limit; W. disticha, H. B. K., snow limit; W. nubigena, H. B. K., 13,000 feet; Aster rupestris, H. B. K., snow limit; Homanthis multiflorus, H. B. K., 12,000 feet; Senecio nubigenus, H. B. K., 12,000 to 13,000 feet; S. Baccharoides, H. B. K., 13,000 feet; Aphanactes Jamesoniana, Wedd., 13,000 feet; Baccharis thyoides, Pers. Syn., 14,000 feet; B. genistelloides, Pers. Syn., 12,000 feet; B. ferruginea, Pers. Syn., snow limit; Conyza pusilla, H. B. K., 13,000 to 14,000 feet.

Ericaceæ.—Vaccinium empetrifolium, H. B. K., 14,000 feet; Gaultheria myrsinoides, H. B. K., 13,000 to 14,000 feet.

Escalloniaceæ.—Escallonia myrtelloides, H. B. K., 13,000 feet.

Gentianaceæ.—Gentiana diffusa, H. B. K., 11,000 to 13,000 feet; G. sedifolia, H. B. K., 13,000 feet to the snow limit; G. rupicola, H. B. K., snow limit; Halenia asclepiadea, Borth., 13,000 to 14,000 feet.

Labiatæ.—Thymus nubigenus, H. B. K., 13,000 feet.

Scrophulariaceæ.—Calceolaria lavandulafolia, H. B. K., 12,000 feet; C. floribunda, H. B. K., 13,000 feet; Veronica serpyllifolia (?) Linn., 14,000 feet; Castilleja nubigena, H. B. K., 11,000 to 14,000 feet.

Plantaginaceæ.—Plantago rigida, H. B. K., snow limit.

Orchidaceæ.—Altensteinia paleacea, H. B. K., 13,000 feet: Myrosmodes nubigenum, Reich., snow limit.

Iridaceæ.—Sisyrinchium Bogotense? H. B. K., 12,000 feet.

Amaryllidaceæ.—Stenomesson aurantiacum, Herb., 11,000 feet; Phædranassa obtusa, Herb., 10,000 feet; Bomarea Caldasiana, Herb., 10,000 to 13,000 feet; Collania glaucescens, Herb., snow limit.

Juncaceæ.—Juncus andicola, Hook, 13,000 feet; Luzula alopecurus, Desr., snow limit.

Cyperaceæ.—Carex Pichinchensis, H. B. K., 13,000 to 14,000 feet.

Gramineæ.—Arundo nitida, H. B. K., 10,000 to 13,000 feet; Festuca dasyantha, H. B. K., snow limit; Poa mulalensis, H. B. K., snow limit.

Filices.—Polypodium subcrenatum, Hooker, 12,000 feet; Jamesonia imbricata, Hooker, 13,000 feet; J. cinnamomea, Kze., snow limit.

Lycopodiaceæ.—Lycopodium Pichinchense, Hooker, 13,000 feet; L. crassum, Willd., 13,000 feet to the snow limit.

XIII.—*The Province of Caravaya, in Southern Peru.* By CLEMENTS R. MARKHAM, F.R.G.S.

Read, June 10, 1861.

IN 1854 I communicated a paper to the Geographical Society, on the Sources of the River Purus, one of the principal tributaries of the Amazons.* This year I have been employed by her Majesty's Government on a special service, which made it my duty to explore some other portions of the region whose streams contribute to feed the Purus, in Southern Peru, and I now propose to transmit some of the results of my observations.

The Purus is the only great affluent, flowing into the Amazons from the south, whose course has never yet been explored. We

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* See Journal of the Royal Geographical Society, vol. xxv. p. 151, 1855.